CASE HISTORY: IMPROVED MAXILLARY GROWTH AND DEVELOPMENT FOLLOWING DIGIT SUCKING ELIMINATION AND OROFACIAL MYOFUNCTIONAL THERAPY

SHARI GREEN, A.A.S., R.D.H. (ret.), C.O.M., B.A.

ABSTRACT

Orofacial myologists are frequently called upon to address retained oral habit concerns. During this process, current I.A.O.M. recommended treatment includes addressing tongue, lip, and jaw rest posture concerns. Following digit sucking remediation, we may also be called upon to address these rest posture issues, and tongue thrust more aggressively together. In this process, facial growth and development and jaw structure may coincidentally improve as a result of 'nature taking its course' by addressing both swallow AND rest posture. In a select subset of clients, dramatic improvements may occur if the timing is right. This article discusses one such case that appears to have yielded a significant improvement in oral postures influencing improved facial and oral growth and development.

KEY WORDS: digit habit elimination; low rest posture; orofacial myofunctional therapy

INTRODUCTION

Socialization and poor self-esteem are associated with the negative effects extended sucking behavior may have on socialization skills. Resolution of a digit sucking habit has been shown to improve self-esteem in a significant percentage of participants following treatment in an orofacial myofunctional habit elimination program (Van Norman, 1997; Green, 2010). Protrusive tongue activity often contributes to a triad of altered appearance, speech, and open lips rest posture issues. In addition it may contribute to isolating many young children from social participation, as peers often view these circumstances as a negative. Victimization or poor social skills can often result as this triad, versus the habit itself, continues into adolescence. Addressing tongue posture aggressively not only from a physical standpoint, but a social standpoint is life changing for some children at a critical juncture in their social development, at a time when peer perception can make the difference between a positive social environment and a negative one. This is empowering for a child, while they may not readily see the aspects of potential improved facial development over time, but rather the immediate effects on their appearance as tongue posture and eating habits improve which may lead to greater peer acceptance.

Certified Orofacial Myologists (COM) address the removal of a noxious entity such as a thumb or pacifier that encourage vertical growth propensity. They encourage the transition of a low postured tongue with strategies that increase the tongue's propensity to elevate, thus assisting in the ultimate capacity for that child to achieve an environment conducive to proper growth and development.

On occasion, that transitional success yields notable results due to the natural course of development of the individual child, and the child's innate personal capacity to improve at a critical juncture in their particular growth trajectory. It is the hope of this author that additional benefits of orofacial myofunctional therapy (OMT) on the developing child will be noted in the future as the research, and this field continues to evolve.

OBSERVATIONS

A nine year old female was referred by her orthodontist for digit sucking elimination therapy and possible tongue thrust remediation. The orthodontist expressed concerns over the existence of a posterior crossbite in conjunction with a significant anterior openbite, and maxillary vertical growth propensity. Following treatment by a certified orofacial myologist (COM), the client was expected to revisit the referring orthodontist for follow up observation and interceptive care.

The patient was seen for an initial orofacial myofunctional consult. The desire to eradicate existing daytime and nocturnal engrained digit sucking behavior was communicated by both the family and the child. Frustration over the inability to succeed in self-extinction of the habit, independent of formal treatment, was evident. Numerous failed attempts at self-eradication of the digit sucking habit were reported.

In addition, some social withdrawal and negative self-esteem over multiple unsuccessful attempts at self-remediation appeared to be of concern. An increase in habit duration and frequency in addition to further bite concerns as expressed by the parents prompted the family to seek an orthodontic consult, which ultimately resulted in the referral for orofacial myofunctional assessment and treatment.

RETAINED DIGIT-SUCKING ELIMINATION TREATMENT

The COM and the family discussed at length an oral habit remediation program. After appropriate desire to participate and compliance capability was determined, the child was deemed an acceptable candidate for full participation. (A child in flux, or a family anticipating imminent substantial change, for example, would not be considered appropriate for a comprehensive digit sucking program.) Determination is based on such aspects as ability and willingness to fully participate by the family and the child, age appropriateness, maturity, anticipation of a successful outcome, and motivational aspects.

This child appeared to be motivated by the esthetic challenges of her bite appearance, her advancing age, and potential awareness of the habit by peers. It should be noted that this client rarely spoke at the initial evaluation, and displayed difficulty with eye contact. Much of the appointment was spent with the child looking downward with occasional eye contact, only if requested, or in silence unless a direct question was offered, which still required prompting for response. Upon assessment of these motivational aspects, and the benefits of participation would likely result in a customized habit program that was determined to be appropriate. Treatment was initiated that day.

Initial consultation for program customization consisted of a discussion of triggering environments, strategies for distraction, a well-defined program of substitution activities, a delineated short and long term reward protocol, and positive reinforcement suggestions to be implemented by both the family at home and the COM from a distance/offsite. A schedule of future visits to follow up over the course of the ensuing 60 days was established.

In addition a routine daily check in schedule between child and orofacial myofunctional therapist was established. The parents were also made aware that they would be able to communicate freely, as needed, throughout that time frame with the COM.

The child and family left the office highly motivated, and this level of motivation remained consistent during the entirety of their digit sucking elimination treatment program. Upon revisiting, approximately 10, 20, and 30 days later, strategies were checked, reward compliance was assessed, and positive reinforcement was offered. No slippage or regression was reported, and compliance was extremely high, as the family indicated that they were 100% compliant in all aspects of program protocols.

The parent and client reported that the habit was fully eradicated as of the first visit. This cessation of the digit habit was reinforced and monitored for consistency for the remainder of the sessions. In addition, increased eye contact was observed on the part of the child as the sessions progressed. The parents reported “increased self-esteem” which appeared to be evident on their thirty day post-digit sucking written survey (Figures 1 & 2).

Figure 1. **Frontal View:** Improved maxillary growth and development in a 9 year old female following digit sucking elimination and a full complement of OMT by an appropriately trained COM. All photos were taken prior to any orthodontic treatment and reflect the result of digit sucking elimination protocols and orofacial myofunctional therapy only.

Initial Evaluation

One Month Visit

Three Month Visit

Six Month Visit

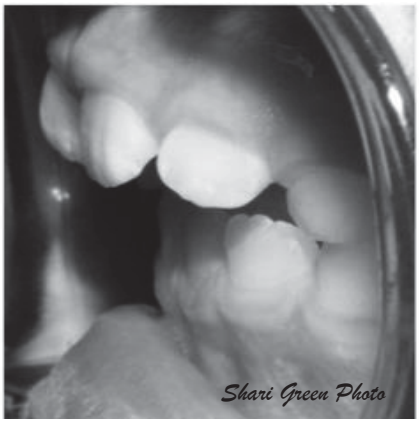
Nine Month Visit

Figure 2. Lateral View: Improved maxillary growth and development in a 9 year old female following digit sucking elimination and a full complement of OMT by an appropriately trained COM. All photos were taken prior to any orthodontic treatment and reflect the result of digit sucking elimination protocols and orofacial myofunctional therapy only.

Initial Evaluation

One Month Visit

Three Month Visit



Six Month Visit

Seven Month Visit

Nine Month Visit

In addition, on visits for day 10 and 20, introduction of tongue, lip, and jaw rest posture techniques were initiated. This consisted of educating the child and family in the appropriate 'spot' location for the tongue, the concept of freeway space in relation to rest position, limited vertical tip and mid tongue elevation strategies, behavioral and environmental cues for conscious thought of rest posture, and retraining exercises to encourage vertical tongue propensity. Four to five exercises were given during sessions 2 and 3, with which the family reported they were in 80% compliance. As therapy progressed, evidence of tongue posture improvement was evident.

THE RESEARCH

The rationale for the inclusion of tongue posture strategies is based on Van Norman's work in 1997 and Green's study in 2010. Van Norman reported that 98 % of 723 subjects with digit sucking habits presented with tongue thrust swallow and/or low rest posture. Green reported that the vast majority of children with digit sucking behavior demonstrate low rest posture of the tongue and or tongue thrust behavior, 99% of 421 subjects. One must also consider the role that tongue posture plays in sustaining an infantile swallow pattern past the normally appropriate developmental juncture of four to six years of age. An oral habit retained past this juncture tends to discourage the normal transition to developmentally appropriate elevated tongue rest posture. Sucking behavior places the tongue inferiorly in the oral cavity, often perpetuating this horizontally or inferior-based tongue posture cycle.

In 1979, Melsen, Stensgaard, and Pederson delineated the relationship between a high incidence of sucking habits and tongue thrust. While in 2009, Ovsenik suggested that children with a history of sucking behavior should be assessed for swallow pattern activity and the presence of orofacial myofunctional disorders. He felt the swallow pattern plays a role in posterior crossbite, and in particular, those with a history of sucking habits. And, in 2010, Melink, Vagner, Hocevar-Boltezar and Ovsenik reported that low rest posture of the tongue due to sucking habits, or a short lingual frenum are associated with unilateral posterior crossbite in four to five year olds.

One may question if the pressure of the sucking act may independently influence the growth and development of the dental arches, contributing to a crossbite tendency. In 1995, Ahlgren studied perioral muscle activity during sucking behavior. Algren found that non-nutritive sucking involves moderate to mild buccinator activity, and strong lip and mentalis activity. The degree of pressure was similar to that which is seen when sucking water through a straw. Activity to the rest of the perioral muscles, i.e. mentalis and lips, was pronounced. In 1995, Lindner and Hellsing found cheek pressure in the canine region vs. the molar region during non-nutritive sucking to be significant, and the circumoral muscles to be significantly active during sucking behavior. Mean cheek lip pressure was measured at 54 g/cm2, or nearly 3 1/2 times greater against the canines as opposed to the second molar region.

One may postulate this pressure concern may have an impact on the developing arch form, but it appears that more research is needed in this area. Another postulate to be considered is that the overextending of the freeway space by the digit being placed in the oral cavity may also lead to differential eruption of the dentition. One thing that is known for certain is that the mere presence of a digit or pacifier superior to the tongue appears to be involved in perpetuating the cycle of altered or inferior tongue rest posture.

Bite correlations have also been studied in the past regarding their relation to tongue thrust patterns. For example, according to Melsen, Stensgaard, and Pedersen (1979), a relationship exists between increased observation of distal occlusion, extreme maxillary overjet, and openbite, and the presence of a tongue thrust/teeth apart swallow, Melsen et. al. postulates that these retained habits, through the production of altered swallow activity, be considered an etiological factor in the development of malocclusion.

In 2010, Mistry, Moles,OP'Neil, and Noar note that anterior openbite is significantly more prevalent in digit sucking children, and early intervention with sucking habits is essential as an important interceptive practice. In addition, in 2010, Dimberg, Bondemark, Soderfeldt, and Lennartsson studied the occlusion of 457 children, three years of age. They found that 70% had one or more malocclusion traits,

consisting of Anterior Openbite (50%), Class II (26%), Overjet (23%), and Posterior Crossbite (19%).

As noted by Pierce (1988), vertical elevation of the tongue at the appropriate developmental juncture encourages proper growth and development of the maxilla. It does not treat a "disorder" or "disease entity" but rather encourages what was naturally intended by nature. Thus, the role of the orofacial myofunctional therapist is and always has been not to "treat a disorder", or "treat a malocclusion", but rather, encourage the development of appropriate patterns of behavior that either directly or indirectly encourage proper facial growth and development in the young child.

In 1997, Benkert coincidentally confirmed that improvement of openbite and overjet may be observed without prior or concurrent orthodontic intervention as a result of orofacial myofunctional therapy. Benkert seeks validation of the specialty area of orofacial myology, and encourages both medical and dental communities to acknowledge and validate tooth movement as a result of this therapy in a positive, collaborative, and beneficial manner.

Currently, more recent research explores the interrelationship between occlusal findings, and the orofacial myofunctional status of the child in the primary and mixed dentition stages. Seemann, Kundt, and Stahl de Castrillon (2011) reported that a combination of factors were often present in the primary dentition of a child with a narrow maxillary arch form. These included open lips rest posture, tongue thrust swallow, speech and articulation challenges, and oral habits. A component to this is interceptive orthodontic treatment, i.e. addressing the narrowing of the maxilla should also correspond with an orofacial myofunctional program aimed at eliminating these orofacial myofunctional concerns. Of course, in the presence of a digit sucking habit, such improvement would be challenged.
A crucial link between narrowed arch form and productive, restorative sleep cycles in children has also become an issue of concern. The desire to learn more on this topic has encouraged much new research.

In 2011, Villa, Rizzoli, Miano, and Malagola C. confirmed the possible role of rapid maxillary expansion (RME) on sleep disordered breathing (SDB) in encouraging optimum sleep behaviors. They found that altering the palatal structure through RME decreased the pediatric apnea hypopnoea index. They concluded that RME may be beneficial in children with malocclusion and pediatric sleep disordered breathing, and found the effects of RME treatment persisted 24 months after the end of treatment. Hsueh-Yu Li and Li-Ang Lee (2009) noted that "improvement in OSA by RME may stem not only from augmentation of the maxillary complex, but also from modifying the resting posture of the tongue" (p.253). New research continues to explore the role concomitant myofunctional therapy may play in this area.

In 2013 Guilleminault C, Huang YS, Monteyrol PJ, Sato R, Quo S, Lin CH concluded that orofacial myofunctional therapy rarely is considered in the treatment of pediatric SDB, yet the absence of orofacial myofunctional treatment following medical intervention, i.e. tonsillectomy and adenoidectomy, is associated with a recurrence of sleep disordered breathing. Thirteen out of 24 subjects who did not receive orofacial myofunctional reeducation following surgical intervention for SDB developed recurrence of symptoms.

DISCUSSION

It is not a forgone conclusion that habit remediation will yield a favorable structural environment for tongue rest posture and swallow pattern remediation training. In fact, it is more common that following a compliment of digit sucking elimination, Phase I Orthodontia is an immediate consideration and the treatment protocol of choice of many dental practitioners.

Recently a strong emphasis has been placed on the importance of palatal expansion in the establishment of optimum pediatric sleep cycles and the exploration of the role a narrow arch form may play on a child's airway and overall health and well-being. Research continues in this area, as well.
Given this new research and these potential concerns, it is crucial that any initial report of airway concerns, sleep disturbances beyond those involved with adapting to night-time rest without the thumb to lull a former digit sucking child to sleep, or reports by the family of excessive snoring be assessed by the child's physician and orthodontist immediately so that

any necessary interceptive treatment can be instituted per their assessment as soon as it is feasible. Perhaps as research continues in this area, orofacial myofunctional therapy will evolve as a necessary component in the optimum treatment in children with SDB, and be included in that child's "interceptive treatment protocol". Time will tell.

Often, an orofacial myologist will prefer to refer a client immediately back to the pediatric dentist or orthodontist in order to expedite any interceptive structural work that has been deemed necessary or appropriate by that child's referring orthodontist so as to most efficiently utilize a young child's critical growth patterns. Once these possible growth concerns are assessed and treated by the dental team, a full complement of OMT is then often introduced.

Notably, there are exceptions. There are rare cases in which orofacial myofunctional therapy can be utilized concurrently, or prior to this interceptive phase of structural treatment. For example, in the case of a child who has been assessed by their physician and does not demonstrate any medical issues, and for whom the dentist feels cannot tolerate appliance therapy due to the severity of their orofacial myofunctional concerns, introductory OMT may be offered. A child may exhibit gagging, choking, and difficulty managing saliva so significant that even attaining some degree of vertical lift propensity, tongue utilization, and pattern improvement will permit and allow that child to move forward more comfortably as they ultimately enter the expansion phase of dental treatment.

The orthodontist may choose to then place an expander of choice when a more comfortable functional muscular environment is attained. As the expander is placed, for example, supportive orofacial myofunctional monitoring can be offered in conjunction with appliance therapy until the expansion is complete. One cannot anticipate full tongue pattern remediation, however, in the presence of a challenged maxillary arch structural form. A multi-phased therapy approach could therefore be utilized to encourage long term tongue thrust remediation following expansion removal.

However, the most common presentation in many orofacial myofunctional practices, involves referral for primarily eliminating the digit habit. Thus, the dental team can begin interceptive orthodontia free of the noxious habit, thus addressing the potential risk of interceptive orthodontic treatment relapse due to the unnatural forces of the digit sucking behavior, and the low postured tongue rest posture and swallow pattern that the digit sucking habit perpetuates. Following this interceptive orthodontic treatment, referral for orofacial myofunctional therapy then traditionally proceeds.

Perhaps this case would have had a similar outcome without a full OMT program. After all, as orofacial myologists we are often encouraged to 'sit back and wait' and let nature take its course (Pierce, 1988). Zimmerman (1998) has also suggested a conservative approach, supporting the theory that allowing a few to several months to pass post-digit sucking habit, prior to initiating a full complement of orofacial myofunctional therapy may be appropriate. But one may also argue the 1985 work of Lopez-Gavito G, Wallen TR, Little RM, and Joondeph DR who determined that more than 35% of treated open-bite patients demonstrated a post retention open bite of 3 mm at a minimum of 9 years and 6 months post retention. They observed a significant trend towards decreasing mandibular arch dimensions with time, in addition to altered facial growth and development.

As a clinician, one often must pull from their own experience, knowing when nature has the propensity to improve a situation on its own, and when increasing encouragement at a crucial juncture will have the potential to be synergistic in effect. One can also utilize the long term research on growth and development to determine the risk vs. reward of not treating vs. treating.

JoAnn Smithpeter, a C.O.M., and Dr. David Covell (2010), demonstrated that orthodontic treatment in conjunction with orofacial myofunctional therapy by a properly trained clinician is highly effective in maintaining closure of anterior openbite vs. orthodontic treatment alone. Fortunately, the decision was made by the referring dentist to aggressively pursue full OMT, not to replace any necessary orthodontia, but rather to compliment it. Was it the therapist's call to make? No, it was not. And, the referring dentist did make this recommendation. But this more recent research coupled with the findings

in the past literature has begun to shape the way many dental teams approach orthodontic treatment regarding facial growth and development. As evidence-based research evolve, more current findings point to the synergy of these two strategies of early interceptive orthodontia coupled with orofacial myofunctional therapy by a properly trained therapist, and the potential benefits this synergistic partnership may provide.

If an orthodontist has determined, in their opinion, that the continuation of rest posture and swallow pattern initiatives would be the best course for that child, COM's are trained to implement those strategies, even if waiting and letting nature take its course may have been an option. However, sometimes the vision of what 'could result' outweighs the "wait and see attitude." And sometimes, it takes a visionary to see this potential. And, sometimes, it takes a concerned parent who wishes to avoid the possibility of a 'repeat of their dental challenges'.

One significant factor, in the particular child presented in this report, was a familial history of tongue thrust in one parent, with a history of success and remediation in that parent's late childhood/early teens. This contributed to a dialogue in which a more aggressive stance on remediation of this child's tongue thrust was requested and encouraged. In addition, observations by the parent and orthodontist remain focused on significant horizontal improvement. Horizontally based growth and development was becoming evident following 30 days of digit sucking cessation. The encouragement and desire for the parent to address this aggressively was a significant factor in discussions with their dental professionals.

TREATMENT POST-DIGIT HABIT

A full orofacial myofunctional program of rest posture retraining and swallow pattern remediation was implemented for this child. The client upon completion demonstrated appropriate tongue elevation, vertically based activity, and swallow patterns of a more appropriate vertical nature. The client remains on a schedule of recall and observation both by their orthodontist, and as part of the orofacial myofunctional therapy protocol.

CONCLUSION

Creating an oral environment conducive to proper facial growth and development is the goal of the orofacial myofunctional therapist. Witnessing resultant increased self-esteem, is often 'the icing on the cake.' Addressing the oral habits associated with these issues, whether the tongue or a digit, is the venue. The eradication of a habit which affects a child socially, whether directly or indirectly, can be life changing for the family, and extremely rewarding for the therapist, and most importantly have a positive effect on the child. When techniques and strategies are implemented correctly and consistently by a properly trained orofacial myologist, individuals may also be blessed with the potential for significant oral developmental improvement, or at the least, the prevention of further acceleration of future potential concerns in certain clients. The sooner in the child's development intervention occurs, the greater the potential for significant growth AND social change exists.

The support of orthodontists and pediatric dentists in recognition of these potential clients can be extremely rewarding. Despite the "wait and see attitude" of the past, many children may benefit from an earlier referral for a full complement of therapy, for a myriad of reasons.

In addition, parental and familial attitudes and history of 'tongue thrust' and its potential ramification by the family may influence the course of treatment, in an effort to 'stave off' the potential risks of 'sitting back and waiting', versus utilizing more aggressive timetable in addressing their child's orofacial myofunctional issues.

One other secondary result remains crystal clear. A child who has begun to show signs of social withdrawal and eradicates a habit earlier rather than later in their formative years will most likely benefit from this experience socially in a profound way.

CONTACT AUTHOR
Shari Green, A.A.S., R.D.H. (ret.), C.O.M., B.A
thumblady@yahoo.com.

References

Ahlgren, J (1995) EMG studies of lip and cheek activity in sucking habits. *Swedish Dental Journal.* 19(3): 95-101.

Benkert K (1997) The effectiveness of orofacial myofunctional therapy in improving dental occlusion. *International Journal of Orofacial Myology.* 23(1): 35-46.

Dimberg L, Bondemark L, Soderfeldt B, Lennartsson B. (2010) Prevalence of malocclusion traits and sucking habits among 3-year-old-children. *Swedish Dental Journal.* 34(1): 35-42.

Green, SE (2010) Confirmational study: a positive-based thumb and finger sucking elimination program. *International Journal of Orofacial Myology.* 36(1): 21-32.

Guilleminault C, Huang, Y (2013) Critical role of myofascial reeducation in pediatric sleep-disordered breathing. *Journal Sleep Medicine* 14(6):518-25.

Li, H., Lee, L. (2009) *Sleep-disordered Breathing in Children*. LeeChang Gung Med J. 32(3): 247-57.

Lindner A, Hellsing E. (1991) Cheek and lip pressure against maxillary dental arch during dummy sucking. *European Journal of Orthodontics*. 13(5): 362-6.

Lopez-Gavito G, Wallen TR, Little RM, Joondeph DR. (1985) Anterior open-bite malocclusion: a longitudinal 10-year postretention evaluation of orthodontically treated patients. *American Journal of Orthodontics.* 87(3):175-86.

Mason R (1988) Special Issue "Orofacial Myology: Current Trends"/Orthodontic Perspectives. *International Journal of Orofacial Myology.* 14(1): 49-55.

Melink S, Vagner MV, Hocevar-Boltezar I, Ovsenik M. (2010) Posterior crossbite in the deciduous dentition period, its relation with sucking habits, irregular orofacial functions, and otolaryngological findings. *American Journal of Orthodontics and Dentofacial Orthopedics.* 138(1): 32-40.

Melsen, B, Stensgaard, K, Pedersen, J. (1979) Sucking habits and their influence on swallowing pattern and prevalence of malocclusion. *European Journal of Orthodontics.* 1(4): 271-80.

Mistry P, Moles, DR, O' Neill, J., Noar, J. (2010) The occlusal effects of digit sucking habits amongst school children in Northamptonshire (UK). *Journal of Orthodontics.* 37(2): 87-92.

Ovsenik M. (2009) American Journal of Orthodontics and Dentofacial Orthopedics. 136(3): 375-81.

Pierce R. (1988) Treatment for the young child. *International Journal of Orofacial Myology.* 14 (1): 33-39.

Rudolph, K, Caldwell, M, Conley, C. (2005) Need for approval and children's well-being. *Child Development*. 76(2): 309-23.

Seemann, J, Kundt, G, Stahl de Castrillon, F. (2011) Relationship between occlusal findings and orofacial myofunctional status in primary and mixed dentition; part IV: interrelation between space conditions and orofacial dysfunctions. *Journal of Orofacial Orthopedics.* 72(1): 21-32. Epub 2011 Mar 11.

Smithpeter, J, Covell, D Jr. (2010) Relapse of anterior open bites treated with orthodontic appliances with and without orofacial myofunctional therapy. *American Journal of Orthodontics and Dentofacial Orthopedics*. 137(5): 605-14.

Van Norman, RA. (1997) Digit-sucking: a review of the literature, clinical observations and treatment recommendations. *International Journal of Orofacial Myology*. 23: 14-34.

Villa M, Rizzoli A, Miano S, Malagola C. (2011) Efficacy of rapid maxillary expansion in children with obstructive sleep apnea syndrome: 36 months of follow-up. *Sleep and Breathing.* 15(2):179-84.

Villa, M, Malagola, P, Pagani, J, Montesano, M, Rizzoli, A, Guilleminault, C, Ronchetti, R. (2007) Rapid maxillary expansion in children with obstructive sleep apnea syndrome: 12 month follow-up. *Journal of Sleep Medicine*. 8(2): 128-34.

Zimmerman, J.(1998) *Success! Achieving habituation in Orofacial Myofunctional Therapy; An Advanced Course* (6/18/1998). San Diego, Ca.